EWASTEU Programme: proposals to minimise the problem of e-waste

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ABSTRACT: Nowadays, many of the electrical and electronic equipment we buy become obsolete in a short time because of the rapid technological advances in this field. Small and large devices such as computers, mobile phones and electronic equipment are reduced to electronic waste (e-Waste), and many of them are disposed as common trash. To change the situation, the EU announced some directives on this subject in order to control the growth of this e-waste and to reduce its impact. In this context, the Yaşar University (Turkey) submitted to the EU a project (EWASTEU) aiming at providing an overview of what is happening with the equipment turning into e-waste, as well as to introduce some proposals to minimise this problem. One of the main issues to be addressed will be the adequacy of the EU directives.

Keywords: e-Waste, EWASTEU, electrical and electronic equipment (EEE), legislation, recycling, environment, sustainability.

Programa EWASTEU: propostas para minimizar o problema dos resíduos elétricos e eletrónicos

RESUMO: Hoje em dia muitos dos equipamentos elétricos e eletrónicos que compramos ficam obsoletos num curto espaço de tempo por causa dos rápidos avanços tecnológicos neste campo. Equipamentos como computadores, telemóveis e equipamentos elétricos e eletrónicos de pequeno e grande porte são transformados em lixo eletrónico e muitos deles são despejados no lixo comum. Para alterar este cenário, a União Europeia publicou diretivas neste domínio com o intuito de controlar o crescimento do lixo eletrónico e reduzir o seu impacto. Neste contexto, a Universidade de Yaşar (Turquia) submeteu à União Europeia um projeto (EWASTEU) com o objetivo de fornecer uma visão do que está acontecer com o equipamento transformado em lixo eletrónico e de apresentar algumas propostas para minimizar este problema. Uma das principais questões a ser respondida será a adequação das diretivas europeias.

Palavras-chave: lixo eletrónico, EWASTEU, equipamento elétrico e eletrónico (EEE), legislação, reciclagem, ambiente, sustentabilidade.

Introduction

As time goes by, life is changing in so many ways that nowadays we cannot imagine it without our sophisticated electrical and electronic items. Technological innovations are changing people's lifestyles very quickly.

In 2009, a research made in Czech Republic, Deutschland, France, Hungary, Italy, Portugal, Slovakia, and Spain showed that people spend in average 190 Euros a year in electronic gadgets. Portugal being the one with the highest value with 274 Euros a year[1].

The electrical and electronic goods are broadly classified in 10 categories: large appliances, small appliances, computer equipment and telecommunication, consumer equipment, lighting equipment, electrical and electronic tools, toys and equipment for sport and leisure, medical devices, monitoring and control instruments, and dispensers[2].

This diversity of equipment generates a problem called electronic waste (e-waste). E-waste is described as "discarded, disposed, reused, recycled, resale or salvaged electrical/electronic devices. Coarsely this term may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators"[3].

E-Waste is a very complex, non-biodegradable and toxic waste, with substances such as plastics, lead, mercury, antimony and cadmium. These compounds are highly dange-

rous pollutants, with health and environmental risks. They bio-accumulate through the food-chain and the hazards are more acute in the event of incorrect disposal and inappropriate recycling techniques[4]. Landfills used for e-waste disposal are prone to leaking of heavy metals and other toxins into the soil which may contaminate not only the soil, but also the watercourses. Landfills are also prone to uncontrolled fires which can release toxic fumes.

Incorrect recycling processes such as open air incineration and acid bath leaching are commonly used for recovery of precious metals from e-waste, making an irreparable damage to the environment. In the absence of suitable processes and protective measures, recycling e-waste results into releasing toxics into the air, water and soil which poses serious environmental and health hazards[4].

As a follow-up to several reports by the European Commission related to this subject, the European Parliament and the Council announced the directives 2002/96/EC on waste electrical and electronic equipment and 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment on 27 January 2003. The EU directives were a step towards taking responsibility for the environment and human health.

The European directive 2002/96/EC aimed to collect 4 kilograms of e-waste per inhabitant per year. In 2010, a EUROSTAT research based on the waste electrical and electronic equipment collection rate in Europe showed that the countries with the lower rate are Romania and Latvia, while on the other hand Norway, Sweden and Denmark have the higher rates. In what comes to Portugal, the rate is 4.4, close to the 4 kilograms aimed in the directive[5].

Since the targets of the above mentioned directives have not all been reached, the European Parliament and the Council came up with a new directive, the directive 2012/19/EU of 4 July 2012. The new directive, not only establishes new targets but also provides the EU member states with the tools to fight illegal export of e-waste more effectively[6].

How are the European directives being transposed into national laws? How is the law being applied in each country? How does the process of registration of electrical and electronic equipment work in each country? How does the management of electronic waste work in each country? How can we minimise the impact of e-waste?

To answer to these questions, a programme has been created called *EWASTEU: Legal Regulations and Implementations on e-waste in EU*. EWASTEU is a EU-funded Intensive Programme designed to look into the electric and electronic wastes which has been proposed by Yaşar University (Turkey) and includes partners from 6 European countries[3].

In this project the participants will examine the ratification of the directives as well as national laws and their impacts. The research will cover both the goals set by each government and their implementation. Problems in goal setting and its implementation will be tracked and suggestion will be offered.

The aim is, not only to examine national ratifications, but also to cast a critical eye over the directives by the European Parliament and the Council[3].

The programme also intends to raise awareness of the issue of e-waste and contribute to the debate by bringing students and teachers from a varied number of departments together[3].

EWASTEU Programme

The first edition of the programme *EWASTEU: Legal Regulations and Implementations on e-waste in EU* occurred from 29th April to 11th May in Izmir, Turkey. This edition included 27 students and 11 teachers from law, engineering and business faculties from 7 different European Higher Education Institutions.

The Institutions who participated in this first edition of the programme were the Yaşar University (host) from Turkey; the Katholieke Hogeschool Leuven from Belgium; St. Cyril and St. Methodius University of Veliko Turnovo from Bulgaria; the National Technical University of Athens from Greece; Kauno Kolegija from Lithuania; and finally the Polytechnic Institute of Castelo Branco and the Polytechnic Institute of Tomar from Portugal.

The participants examined the national laws and their impacts while taking a critical look at the European Parliament's and the Council's directives. The programme also included a case study in Bornova region concerning the collection of e-waste.

The participants were able to gain the following knowledge, skills and competencies:

- Improved multidisciplinary knowledge about how to handle e-waste;
- Comparative knowledge concerning the different laws, regulations and implementations in Europe;
- Increased awareness and responsibility on environment and sustainable development;
- Ability to work in an international group as part of a team;
- Enhanced knowledge about different cultures and improved cultural exchange;
- Increased language skills[3].

The next edition of this Programme will be hosted by the Polytechnic Institute of Tomar (Portugal).

E-Waste in Portugal

Despite the significant increase in e-waste recycling in recent years in Portugal due to the numerous campaigns to raise public awareness, there still are people who do not know how to deal with this type of waste. Many are unaware that everytime they buy an appliance, the seller is obliged to receive the old equipment and ensure proper disposal for free.

In Portugal the transposition of EU directives 2002/96/EC and 2002/95/EC concerning waste electrical and electronic equipment was enabled through Decree-Law no. 230/2004 dated December 10, 2004.

The Portuguese Decree-Law replaces the previous legislation on e-waste management. The Portuguese law is consistent with the directives, imposing a ban on the use of six hazardous substances, namely lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers.

This Decree-Law establishes that producers are responsible for financing the management of their own residues. Producers can assume their obligations individually by paying financial guarantees which prevent costs of waste management from falling on society or on the other producers[2].

Recently the directive 2012/19/EU was transposed to the Portuguese legislation through the Decree-Law no. 67/2014 dated May 7, 2014, that replaces the previous Decree-Law[7].

In Portugal, there are two management entities engaged in the management of e-waste: Amb3E and ERP Portugal.

The Amb3E is a Portuguese non-profit association that aims the organization and management of an integrated system to manage electronic waste. It was created through Decree-Law no. 230/2004 dated December 10, 2004. Right now it has around 60 member companies and more than 1100 subscribers[8].

The Amb3E has 77 reception centres located throughout the country[8] (*cf.* Figure 1).

Figure 1: Location of the Reception Centres.

Among the main initiatives of the Amb3E to promote e-waste recycling are "Electron Point", the "School Electron" and "Electron Barracks"[8].

The purpose of the "Electron Point" (average size container) is the collection of end-of-life electrical or electronic appliances in order to ensure that they are properly recycled. Electron Points can be found in almost all shopping centres of the country and GALP fuel stations (Indoor Electron Point). A pilot project is currently being developed to put electron points on public roads, a smaller container but with the particularity of being underground (Outdoor Electron Point)[8].

"School Electron" is a cooperation project between Amb3E, the Ministry of Education and Science and the Portuguese Environment Agency. The main goal is to raise awareness of students, parents, teachers and staff about the importance of recycling waste in general and electrical and electronic equipment at end of life, in particular, by introducing coursework on the subject[8].

The campaign "Electron Barracks" took place in 2011 and aimed to support the Portuguese Fire Corporations, by raising awareness to environmental issues associated with e-waste, including batteries and portable accumulators embeddable in electronic and electrical equipment[8].

The goal of this awareness raising campaign was essentially that fire corporations would be able to collect as many kilograms as they could of electronic and electrical waste during a given period of time. Such action would promote a better environment and support the corporations by awarding prizes to the best performing ones. This campaign was one of the prized initiatives of the 5th edition of the Green Project Awards held in 2012[8].

On the other hand, the ERP Portugal belongs to the European Recycling Platform, created in December 2002. The license for managing waste electrical and electronic equipment was attributed to ERP Portugal in April 2006 by a joint order of the Ministry of Economy and Innovation and the Ministry of Environment and Territorial Planning[9].

The ERP Portugal founders are Electrolux, the Group Gillette, Hewlett Packard and Sony Portugal, and all of them aim to raise public awareness and inform about the main problems associated with e-waste, as well as its management practices and treatment. Right now, there are 65 reception centres[9].

The main initiative developed by ERP Portugal is called Generation Depositron. In Portugal there are around 422 depositrons. This is a project in partnership with the Eco-Schools EBFA Association (European Blue Flag) that is to inform and educate children and young people, and through them the general population, about the importance of recycling and appropriate disposal of electrical and electronic waste including batteries and accumulators[9].

In Portugal the register is mandatory for those who place electrical and electronic equipment on national territory and the ANREEE (National Association of Record Producers of Electrical and Electronic Equipment) is responsible for assuring, organising and keeping the mandatory register of producers of electrical and electronic equipment (Decree-Law no. 230/2004 of 10th December, altered by Decree-Law no. 132/2010 of 17th December) and batteries and accumulators (Decree-Law no. 6/2009 of 6th January)[10]. This entity is also responsible for informing and alerting the official public bodies on possible violations of the legislation.

At the end of 2012, 1641 manufacturers, retailers own brand and importers of electronic and electrical equipment were registered in Portugal, which represents an increase of 1.7 per cent compared to 2011.

Table 1: Variation of unites and weights by legal category[10]

Comparison 2012/2011	Units		Δ Units	Weights (ton)		Δ Weights
	2012	2011		2012	2011	
Cat 1. Large Household applianc.	2.370.356	2.902.175	-18,32%	69.816,70	76.016,86	-8,16%
Cat 2. Small Household applianc.	5.997.344	7.626.830	-21,37%	9.099,99	12.261,11	-25,78%
Cat 3. IT Equipment	19.707.131	22.279.246	-11,54%	11.630,37	15.110,93	-23,03%
Cat 4. Consumer Equip.	6.661.503	7.125.873	-6,52%	11.336,86	9.148,18	-23,92%
Cat 5. Lihting Equip.	17.925.603	19.512.379	-8,13%	6.337,03	6.885,97	-7,9%
Cat 6. EE Tools	889.153	1.262.321	-29,56%	4.296,98	5,684,01	-24,40%
Cat 7. Toys, Leisure and Sport Eq.	2.808.008	3.214.626	-12,65%	1.606,86	2.791,48	-42,44%
Cat 8. Medical devices	454.179	455.348	-0,26%	643,3	936,1	-31,29%
Cat 9. Monitoring and control	730.022	794.192	-8,08%	588,46	975,15	-39,65%
Cat 10. Automatic dispensers	630.389	703.703	-10,42%	1.644,93	936,72	-75,61%
TOTAL	58.173.688	65.876.693	-11,69%	117.001,41	130.746,51	-10,51%

E-Waste: some solutions

The main objective of the EWASTEU is to analyse how the EU directives related with electronic waste are applied in the different countries. As a result of the work done in the first edition of the programme, a report will be launched that will include the differences between the national ratifications of the EU directives. In this edition the participants also had the opportunity to contribute with some remedial proposals to help minimise the problem of e-waste and its impact on various areas.

a) *Legislation*

As the goals displayed in the first directives were not reached, a new directive was needed. In 2012, the European Parliament and the Council announced a directive (2012/19/EU). In what comes to the Portuguese legislation this directive was transposed through Decree-Law no. 67/2014 dated May 7, 2014. What's more, there still are companies that don't receive the old appliances. It is urgent that all countries transpose, as soon as possible, the European directive into national law.

b) *Education*

One of the conclusions of the programme was related to people's unawareness. Faced with this observation, it was proposed that an E-Waste Education Programme should be established in schools, in elementary and even primary at least. Children can easily understand that recycling, not only regular waste but also electronic appliances, is extremely important and turn it into a routine. From schools, the word "e-waste" would be spread in the blink of an eye to their families and friends.

Nowadays, Portuguese children from primary schools have a strong environmental conscience, because these issues are part of the normal curriculum of primary education, which makes the introduction of the e-waste problematic extremely simple.

c) *Production*

Encouraging the production and consumption of 100% recycled green products is another proposal. Certain companies are already developing some projects, like Western Digital with hard disks, but they are clearly not enough.

d) *Social responsibility*

Another proposal is to hold buyers and producers responsible for their electrical and electronic equipment. The legislation already makes producers accountable but, in what comes to buyers, incentives for returning the old equipment when purchasing a new one should be created.

e) Extended producer responsibility

The extended producer responsibility takes the onus for finding effective ways to reuse and recycle the components of electrical and electronic goods of waste management companies and puts it back on the producers themselves. This is an infinitely more sensible solution as manufacturers are able to recycle separate parts and use them to build new products of the same type, or more easily create a system to achieve this.

f) *Privacy*

Another problem was related to the privacy and security of the data in the appliances. All cell phones and computers can save data. Many broken and out of use appliances that are sent to be recycled have data in their hard drives, making it easy for people to have access to private information. In order to ensure the privacy and security of data, a mechanism should be implemented. A mechanism should be devised where the companies responsible for this process would create a certificate, taking responsibility for the removal of all the data.

Conclusions

With all the information collected about the hazardous effects of e-waste on human health and the environment, there is a need to change people's minds. The lack of awareness of people throughout the world is becoming a serious issue, since they don't know what they are doing with their electronic and electrical equipment and what happens to it. Each country must accept this fact and start to do something, like adopting the legislation, implementing an Education Programme or even increasing social and corporate responsibility.

This first edition of the project that took place in Yaşar University (Turkey) examines how the EU directives related with electronic waste are being applied in the different countries and the impact it had among the participants, turning the project successful. Once analysed, some solutions and measures to help the environment are slowly taking shape. Some of the participants are considering starting with small projects in their own towns in order to draw people's attention to the situation. At the end of the programme, the participants showed the desire to create an action group, where some of the proposals presented will be put into practice and the results examined in the next edition of this Programme to be held at the Polytechnic Institute of Tomar (Portugal).

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Artigo recebido em 29.10.2013 e aprovado em 20.10.2014